

SECULIFE UP

Digital Ultrasound Meter

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<p style="text-align: center;">GOSSEN METRAWATT SECULIFE UP ULTRASOUND WATTMETER TABLE OF CONTENTS</p>

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WARNING - USERS

The SECULIFE UP is for use by skilled technical personnel only.

WARNING - USE

The SECULIFE UP is intended for testing only and should never be used in diagnostics, treatment or any other capacity where it would come in contact with a patient.

CAUTION - MODIFICATIONS

The SECULIFE UP is intended for use within the published specifications. Any application beyond these specifications or any unauthorized user modifications may result in hazards or improper operation.

CAUTION - SERVICE

The SECULIFE UP is intended to be serviced only by authorized service personnel. Troubleshooting and service procedures should only be performed by qualified technical

CAUTION - ENVIRONMENT

Exposure to environmental conditions outside the specifications can adversely affect the performance and accuracy of the SECULIFE UP. If the unit is outside the Operating Specifications, allow it to acclimate to specified conditions for at least 30 minutes before

CAUTION - INSPECTION

Inspect the SECULIFE UP before each use for wear. It should be serviced if any parts are in question.

CAUTION - LIQUIDS

Do not submerge or spill liquids on the SECULIFE UP. Do not operate the SECULIFE UP if internal components not intended for use with fluids may have been exposed to fluid, as the internal leakage may have caused corrosion and be a potential hazard.

CAUTION - CLEANING

Do not immerse. The SECULIFE UP should be cleaned by wiping gently with a damp, lint-free cloth. A mild detergent can be used if desired.

NOTICE – SYMBOLS

Symbol **Description**



Center Negative



Per European Council Directive 2002/95/EC, do not dispose of this product as unsorted municipal waste.

NOTICE – ABBREVIATIONS

C	Celsius
°	degree
DUT	Device Under Test
F	Fahrenheit
g	gram(s)
IEC	International Electrotechnical Commission
kg	kilogram(s)
MHz	Megahertz
mm	millimeter(s)
mW	milliwatt(s)
PPM	Parts Per Million
Lbs	pounds
USA	United States of America
V	Volt(s)
VAC	Volt(s) Alternating Current
VDC	Volt(s) Direct Current
W	Watt(s)

NOTICE – DISCLAIMER

GMC-I MESSTECHNIK GMBH WILL NOT BE RESPONSIBLE FOR ANY INJURIES SUSTAINED DUE TO UNAUTHORIZED EQUIPMENT MODIFICATIONS OR APPLICATION OF EQUIPMENT OUTSIDE OF THE PUBLISHED INTENDED USE AND SPECIFICATIONS.

NOTICE – DISCLAIMER

GMC-I MESSTECHNIK GMBH RESERVES THE RIGHT TO MAKE CHANGES TO ITS PRODUCTS OR SPECIFICATIONS AT ANY TIME, WITHOUT NOTICE, IN ORDER TO IMPROVE THE DESIGN OR PERFORMANCE AND TO SUPPLY THE BEST POSSIBLE PRODUCT. THE INFORMATION IN THIS MANUAL HAS BEEN CAREFULLY CHECKED AND IS BELIEVED TO BE ACCURATE. HOWEVER, NO RESPONSIBILITY IS ASSUMED FOR INACCURACIES.

NOTICE – CONTACT INFORMATION

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EU - KONFORMITÄTSERKLÄRUNG
DECLARATION OF CONFORMITY



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 Hersteller/ Manufacturer: GMC-I MESSTECHNIK GMBH
 Anschrift / Address: Südwestpark 15
 D - 90449 Nürnberg
 Produktbezeichnung/ Product name: Digitales Ultraschallmessgerät
 Digital Ultrasound Meter
 Typ / Type: SECULIFE UP
 Bestell-Nr / Order No: M695Y

Das bezeichnete Produkt stimmt mit den Vorschriften folgender Europäischer Richtlinien überein, nachgewiesen durch die vollständige Einhaltung folgender Normen:

The above mentioned product has been manufactured according to the regulations of the following European directives proven through complete compliance with the following standards:

Nr. / No.	Richtlinie	Directive
2014/35/EU	Elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen - Niederspannungsrichtlinie – Anbringung der CE-Kennzeichnung : 2017	Electrical equipment for use within certain voltage limits - Low Voltage Directive - Attachment of CE mark : 2017

<u>EN/Norm/Standard</u>	<u>IEC/Deutsche Norm</u>	<u>VDE-Klassifikation/Classification</u>
EN 61010-1 : 2010	IEC 61010-1 : 2010	VDE 0411-1 : 2011

Nr. / No.	Richtlinie	Directive
2014/30/EU	Elektromagnetische Verträglichkeit - EMV Richtlinie -	Electromagnetic compatibility - EMC directive -

Produktfamilienorm / Product family standard

EN 61326-1 : 2013

Nürnberg, den 10.03.2017

Ort, Datum / Place, date:

Geschäftsführung / managing director

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften. Die Sicherheitshinweise der mitgelieferten Produktdokumentationen sind zu beachten.

This declaration certifies compliance with the above mentioned directives but does not include a property assurance. The safety notes given in the product documentations, which are part of the supply, must be observed.

INTRODUCTION

Measurement of power output levels of diagnostic and therapeutic ultrasound equipment has become increasingly important to determine exact patient exposure levels in case a potential risk exists to the patient. Since the Radiation Control for Health & Safety Act of 1968 and the 1976 Medical Device Amendments to the FDA Act became effective, all manufacturers of diagnostic Doppler ultrasound equipment are required to submit information regarding their maximum peak and average exposure level, beam patterns, and other pertinent information. Hospitals are responsible for regularly scheduled testing (every six months) of output power and safety to maintain their accreditation.

The Ultrasound Power Meter, Model SECULIFE UP, is designed to measure the ultrasound power output of diagnostic or therapeutic transducers up to 30 watts. The principle of measurement is the radiant force method. The SECULIFE UP uses a positioning clamp with two locking ball joints to hold the transducer in degassed water above a conical target. The ultrasonic energy passes through the water to reflect off the target and is then absorbed by the rubber lining. The radiant power is directly proportional to the total downward force (weight) on the target.

This weight is then transferred through the target support assembly to the electro-mechanical load cell inside the scale. The cell is in a computer-controlled feedback loop and produces a digital readout in watts of power custom units 'C' on the display or grams of force "G" on the display. The choice of units (grams or watts) is selected by a front panel push button. The SECULIFE UP is supplied with a plug-in 120 VAC to 12VDC 500 mA adapter (using another adapter not rated or wired the same may damage unit). Unit can be operated off 4 AA batteries for over 40 hours. The SECULIFE UP has a display resolution of ± 50 milliwatt.

OPERATING INSTRUCTIONS

Water as a Measurement Medium*

The measurements are to be performed in water because ultrasound propagation in water closely approximates that in tissues. The ultrasonic attenuation in water can be taken as a lower limit on the attenuation that will be encountered in the body. Large areas in the body can consist of low attenuating material such as urine and amniotic fluid. The use of water prevents measurements in a more highly attenuating material, such as liver equivalent gels, from representing the highest possible intensities that might be encountered in the body.

* Ultrasound propagation in water closely approximates human tissue and degassed water is the generally accepted test medium for ultrasound transducers.

Degassed Water

Ultrasound Power measurement accuracy is affected if the water contains more than 5-10 PPM of air. To degas, boil distilled water for 30 minutes, then seal the container tightly and place it in a refrigerator. An alternate method of degassing water is to heat the water to the boiling point, then pull a vacuum on it for five to ten minutes. The degassed water storage container should be made of glass or plastic. Polystyrene containers should not be used since they allow oxygen to permeate and degrade the water quality. Before testing, pour water into tilted test tank with minimum amount of turbulence. The test tank water surface will absorb oxygen, therefore a change of degassed water is recommended before each test. Water temperature affects accuracy, so it is recommended to use an ambient testing temperature of 24.0 ± 3.0 °C (75.2 ± 5.4 °F). Sonic energy agitates the water surface through heating and scattering

The time duration of each test should be limited to a few minutes. Prolonged testing, particularly at higher power levels, will show visible signs of air bubbles on the transducer, target, and the absorbing rubber surface.

Transducer Wetting and Placement

To avoid introducing air into the degassed water, insert the transducer at a 45° angle, then position so it is facing the target. Verify that the transducer surface is uniformly wetted, if not, wipe the surface clean using your finger. The transducer should be pointed toward and center-positioned directly above the cone target. Small measurement variations will occur due to placement of the transducer. Try various positions above the target to minimize the magnitude of error due to positioning.

Selecting a Location for Operation

The SECULIFE UP should always be used in an environment free from excessive air currents, corrosives, vibration and temperature or humidity extremes. These factors will affect the displayed readings.

DO NOT operate the SECULIFE UP

- Next to open windows or doors causing drafts or rapid temperature changes!!!
- Near air conditioning or heat ducts!!!
- Near vibrating, rotating or reciprocating equipment!!!
- Near magnetic fields or equipment that generates magnetic fields!!!
- On an unlevelled work surface!!!

Allow sufficient space around the instrument for ease of operation and keep away from radiant heat sources. Never set any material on the SECULIFE UP or place your hands or fingers on it while taking reading.

LAYOUT



1. **On/Zero – Off** - Button: Press to turn unit on or zero, press and hold until OFF is displayed then release to turn off.
2. **Print Unit**: Press to print, press and hold then release when desired unit is displayed.
 - “g” = grams
 - “c” = custom = Watts
3. **Display**: 7 Segment, 6 digit display: Displays readings.
4. **Stability Indicator**: Displays once the scale is stabilized and ready to take a measurement.
5. **Test tank**: Must be filled with degassed water
6. **Transducer clamp**: Holds the ultrasonic transducer over the test tank
7. **Precision weight**: Used for testing the calibration

OPERATING PROCEDURE

1. Place the SECULIFE UP on a stable and level surface. Avoid air currents and mechanical vibrations. Level the unit.
2. Loosen the transducer positioning clamp and move it out of the way. Position the tank on the rubber circle.
3. Fill the test tank to ¼ inch (6.4 mm) below the top of the tank liner with fresh degassed water at a temperature of 24.0 ± 3.0 °C (75.2 ± 5.4 °F).
4. Plug the AC Adapter into a 120 VAC, 60 Hz power outlet and plug the cord into the power jack at the rear of the unit (unless operating from battery power).
5. Lower the cone target into the concentric target support sleeve located behind the test tank (small tube inside of larger tube), while simultaneously placing the cone target into the tank. If the cone can swing in an arc, it is not down far enough. Tip the rod back and forth slightly to fully engage the rod. Press the **ON/Zero - Off** button to zero the unit.
6. To avoid introducing air into the degassed water, insert the transducer at a 45° angle. Then position so it is facing the target ⅛ to ¼ inch (3.2 to 6.4 mm) below the water level, parallel to the water surface, and directly above the center of the cone. Check the transducer surface for uniform wetting (no air pocket or bubbles should be on its surface).
7. Allow 5 minutes for the scale to stabilize. With no ultrasonic power applied to the transducer, press the **ON/Zero - Off** button to zero the unit.
8. Check response by placing the 1 gram weight on the arm of the cone target (the flat part that is out of the water). The SECULIFE UP should read 1.00 ± 0.10 grams. Change the units to the watts (Custom) mode by pressing and holding the Print Unit button until “C” is displayed, the release. The unit should read 14.65 watts ± 0.2 watts. 1 gram is equal to 14.65 watts.
9. Remove the 1 gram weight. Press the **ON/Zero - Off** button to zero the unit.

10. After the display's stability indicator is shown, activate the DUT and record the measurement. Rezero before each measurement and take your power reading when the display has stabilized. It is a good practice to take three readings and average them. If measurement conditions are not stable, use the grams mode and multiply the readings by 14.65 to obtain Watts.

11. Determine the maximum peak power with the maximum duty cycle and pulsed output settings with the equation:

$$\mathbf{PAVE = Pp / Rtpa}$$

PAVE = calculated average power

Pp = Peak Pulsed Power Setting on unit under test

Rtpa = Ratio of Temporal Peak to Average Power (from each manufacturer)

12. To calculate the watts/cm² output, take the total watts reading from the unit and divide by the area. The area is $\pi D^2 \div 4$ (**D** is the diameter of the transducer) if the transducer is smaller than the cone. Otherwise, use (8.2 cm) the cone's diameter as the area.

13. When finished, turn the unit off by pressing and holding **ON/Zero/Off** button until OFF is displayed, then re-lease. Unplug the SECULIFE UP, empty the tank and dry. Dry target cone. Place in foam in case along with power adapter. Position transducer holder over tank. Position transducer holder over tank positioner. Close case and latches.

GENERAL OPERATING NOTES

Line / Battery Power: The SECULIFE UP is supplied with a 120 VAC 60 Hz adapter. Check for correct line voltage before use.

1. Slowly fill tank with degassed water. Press the **On/ Zero/Off** button to turn unit on. Select Watts (C) or Grams (G) by pressing and holding the **Print/Unit** but-ton. Release the button when unit needed is displayed. Press the **On/Zero/Off** button to zero unit. Place cone target assembly into test tank and in the small tube in-side of the large tube. Press the **On/Zero/Off** button to zero the unit.
2. Place ultrasound transducer 1/8 inch into water above the center of the cone target using the clamp assembly.
3. Place the standard 1 gram test weight on the flat part of the cone target assembly. It should read (1.000) grams or 14.65 watts.
4. Zero the unit and take the power reading. Repeat as required.
5. To turn unit OFF press and hold **On/Zero/Off** until OFF is displayed, then release.

Battery operation optional. To Install Batteries:

Hold unit upside down. **Be careful not to allow unit to rest on target support sleeve!**
Remove battery compartment cover and install 4 AA alkaline batteries, observing orientation marks. Replace the battery compartment cover.

Be careful not to damage the target support sleeve.

CALIBRATION

Critical programming such as calibration and Custom mode parameters are locked in and cannot be changed by the user. If reprogramming to the original parameters does become necessary, the unit must be returned to GMC's facility in Germany, Nuremberg. An hourly labor rate will be charged for any necessary repairs and recalibration fees will be assessed. A calibration certificate will be returned with the unit.

Checking Calibration

A 1-gram weight is supplied to check the calibration and programming. With the transducer under test turned off, zero the unit. Place the weight on the arm of the cone target. Within 3 seconds the unit should read 14.65 watts ($\pm .2$ watts) or 1.000grams ($\pm .01$ grams). If this reading is significantly off, the SECULIFE UP needs to be recalibrated. Send it to GMC Instruments Co. for calibration. It is recommended that the SECULIFE UP be returned to GMC on a yearly basis for calibration and certification.

THEORY

Theory of Measuring Ultrasound Power with The Radiation Force Method

Ultrasound is a form of energy that sets the particles in the isonated medium into vibrational motion. The particles then possess a kinetic energy. If $d*P_m$ is the rate of the flow of this energy about an area $d*A$, then the mean acoustic energy is:

Eq. 1 $I = d*P_m/d*A$

I = Acoustic intensity at a point in that area, Watts/cm²

When a plane sound wave propagates through a uniform non-absorbent medium, the intensity must be the same for all points in the wave. Let E represent the energy density, i.e., the energy per unit volume. When the sound energy passes through a unit cross-sectional area with a speed c , the intensity is:

Eq. 2 $I = c*E$

E = Energy density per unit volume, ergs/cm³

c = Ultrasound wave velocity, cm/sec

The radiation pressure effect can be explained by analogy to the application of an alternating electric voltage to a non-linear load. With the non-linear load it appears that both AC and DC components are present. In ultrasonics the non-linear element is the density of the fluid and hence acoustic impedance (load) varies in the same periodical manner as the density. Therefore in ultrasound the two components of pressure, one alternating and the other direct are present. The average AC pressure per cycle is zero, but the DC pressure of radiation is:

Eq. 3 $P^*_{\tau} = I/C$

P_{τ} = Pressure of Radiation, ergs/cm³

Therefore, from the above two equations, the pressure of radiation (P_{τ}) is equal to the energy density (E).

Eq. 4 $P^*_{\tau} = E$

It is this DC pressure of radiation that can be measured. At low frequencies, below 100 KHz, a standard high frequency hydrophone can be used. For higher frequencies, generally used in medical applications, 1-15 MHz, hydro-phones are not available. At these frequencies the force can be measured using a precision balance and a radiation force target that is perfectly absorptive. The conversion from force to power can be accomplished using the equation:

Eq. 5 $p = W * g * c$

W = measured force, grams

g = acceleration, dynes

c = velocity of ultrasound, cm/sec p = power, ergs/sec

By combining all constants together and converting from ergs/sec to watts, we obtain a simplified equation that is used to calculate the ultrasonic power once the force is measured:

$P = w$ (14.65)

P = Ultrasonic power in watts

w = Ultrasonic force in grams

To determine the ultrasonic watt density (watts/cm² or watts/in²) of a given transducer the P is divided by the cross sectional area of the transducer.

MAINTENANCE

Verification of Proper Scale Functioning: Small variations of water surface motion, air currents or mechanical movements may cause uncertainties in power measurements.

To test scale accuracy at low levels, set up the scale as in the Operating Procedure (Pages 12 & 13). Place the 14.65 watt weight on the flat surface of the target arm. Read meter three times; readings should be within $\pm .05$ counts (for example, 14.60 to 14.70). In case of doubt about lower power resolution, repeat the same procedure using light objects such as thin paper slices to produce readings of 5 to 10 counts; repeat readings. Average uncertainty should be within $\pm .05$ counts on the watts scale. Avoid mechanical and air movement or variations in magnetic fields while making tests.

Out of Measurement Range Warnings: Model SECULIFE UP accommodates weight differential of ± 120 grams. When the scale exceeds this range, "Err 2" will be displayed. Something may be pressing hard on the target or support. "Err 2" also indicates underweight condition. If no obvious error has been made by the user the unit should be returned for service when any code is displayed.

No Display: 1) Make sure the AC adapter's plug is fully seated in the jack at the back of the unit. 2) Use a voltmeter to verify the adapter is producing 12 volts DC (approximately). Call our service department for assistance.

MANUAL REVISIONS

<u>Revision #</u>	<u>Revisions Made</u>
Rev 01	Origination
Rev 02	Miscellaneous Edits and Additions, Pictures Updated

LIMITED WARRANTY

WARRANTY: GMC-I MESSTECHNIK GMBH WARRANTS ITS NEW PRODUCTS TO BE FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP UNDER THE SERVICE FOR WHICH THEY ARE INTENDED. THIS WARRANTY IS EFFECTIVE FOR TWELVE MONTHS FROM THE DATE OF SHIPMENT.

EXCLUSIONS: THIS WARRANTY IS **IN LIEU OF** ANY OTHER WARRANTY EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF **MERCHANTABILITY** OR FITNESS FOR A PARTICULAR PURPOSE.

GMC-I MESSTECHNIK GMBH IS NOT LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

NO PERSON OTHER THAN AN OFFICER IS AUTHORIZED TO GIVE ANY OTHER WARRANTY OR ASSUME ANY LIABILITY.

REMEDIES: THE PURCHASER'S SOLE AND EXCLUSIVE REMEDY SHALL BE: (1) THE REPAIR OR REPLACEMENT OF DEFECTIVE PARTS OR PRODUCTS, WITHOUT CHARGE. (2) AT THE OPTION OF **GMC-I MESSTECHNIK GMBH**, THE REFUND OF THE PURCHASE PRICE.

SPECIFICATIONS

ULTRASONIC POWER MEASUREMENT	
POWER RANGE	0 to 30 W
RESOLUTION	± 50 mW
MINIMUM DETECTABLE POWER LEVEL	50 mW
ACCURACY	± 3 % + One Count Reading
DIGITAL FILTER	2.5 seconds Integration
DUT OPERATING FREQUENCY	0.5 to 10 MHz
DUT MAXIMUM TRANSDUCER SIZE	101.6 mm
TEST MEDIUM	Degassed Water @ 24.0 \pm 3.0 °C

ELECTRICAL	
BATTERY	Quantity 4, AA (IEC LR6) Alkaline
BATTERY ELIMINATOR	12 V AC, 500 mA 20-40337 (USA) 20-40341 (EURO)

PHYSICAL & ENVIRONMENTAL		
DISPLAY	6-digit, Backlit LCD	
CONSTRUCTION	TANK LINING	12.7 mm thick Neoprene
	CARRYING CASE	Molded Polyethylene
SIZE	OVERALL (Including case): 431.8 x 330.2 x 152.4 mm	
WEIGHT	OVERALL (Including case): < 4.5 kg	
OPERATING RANGE	15 to 30 °C	
STORAGE RANGE	-40 to 60 °C	

SERVICE

Productsupport

If required please contact:

GMC-I Messtechnik GmbH
Product Support Hotline
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Service Center

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This address is only valid in Germany.
Please contact our representatives or subsidiaries for service in other countries

* DAkkS Calibration Laboratory
for Electrical Quantities D-K-15080-01-01
accredited per DIN EN ISO/IEC 17025

Accredited quantities: direct voltage, direct current value, direct current resistance,
alternating voltage, alternating current value, AC active power, AC apparent power,
DC power, capacitance, frequency and temperature

Shipping Instructions

To make certain that your Ultrasound Power Meter arrives at our repair department unharmed during shipment, please follow these instructions:

1. Empty water from tank and dry. Place the weight under the screw provided.
2. Place all components in foam in case. Ensure transducer clamp is tighten over tank positioner. Add bubble wrap or foam close case and latches.
3. The package used for shipping should be strong and large enough to allow for adequate packing material on all sides of unit.
4. Ship to:

By using the above instructions you will avoid additional charges which can be incurred if the unit is not packaged well enough to withstand rough handling during shipment.

Neither GMC nor the shipping company can be held responsible for damage if these instructions are not followed.

Edited in Germany • Subject to change without notice • A pdf version is available on the internet



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